

# CONFUSION ABOUT YOGURT—COMPOSITIONAL AND OTHERWISE<sup>1</sup>

MANFRED KROGER AND JOHN C. WEAVER

*Division of Food Science and Industry  
The Pennsylvania State University, University Park 16802*

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## ABSTRACT

The fat, protein, total solids, and caloric contents of 44 yogurt samples obtained in the Central Pennsylvania area varied widely. Averages and ranges were: 1.18% and 0.82-2.04% for fat; 4.29% and 3.09-5.38% for protein; 24.97% and 15.10-30.73% for T.S.; 103.2 cal/100g and 62.3-127.0 cal/100g. Package overweight was often excessive. Yogurt composition is discussed in relation to often quoted, but outdated official, figures. Questions as to yogurt's role in the dairy industry and yogurt uniformity are raised.

Prompted by a survey by Duitschaeffer et al. (4) of yogurt quality and composition in Ontario, Canada, a similar study was made of yogurt sold in Central Pennsylvania. The Canadian results were and should be disturbing to both consumers and the dairy industry. The fat content of 152 samples from 13 manufacturers varied from 0.9 to 3.6%, with a mean of 1.98%. Solids-not-fat content ranged from 10-28.9%, with a mean of 18.9%. The mean overweight was 7.2%.

Relatively little has been published on yogurt composition and quality (5). There is no doubt that yogurt is a widely misunderstood product (1), that it is a favorite with persons devoted to so called diet or health foods (6), and that the dairy industry is experiencing a yogurt boom that has been gently accelerating over the past few years. It must be admitted that yogurt is a safe, wholesome, nutritious milk product. It is a product with vastly higher consumption figures in other countries. Future popularity in North America seems assured provided quality and composition of yogurt is high and uniform.

We feel that at present yogurt package labels are somewhat misleading, that the low-fat nature of yogurt with its implied diet benefits is meaningless in view of the product's relatively high caloric content (higher than that of whole milk), and that the consumer has no means of relating the price of yogurt to its food value. On the other hand, because of almost constant overfill and generally higher-than-milk protein content, the yogurt buyer usually is assured of a good buy.

Our survey was conducted with the objective to

point out to yogurt manufacturers that continuing gross variations in yogurt composition and quality might turn the public away from the product. Yogurt manufacturers can well afford to identify all the nutritional components in yogurt. They should strive for national product standardization. And finally, they should not continue to view and advertise yogurt as a low-calorie food, to avoid a backlash from an increasingly better educated and sophisticated public.

The therapeutic and other values of yogurt have never been clearly substantiated to be of benefit to the general public. Yogurt should not be treated as a universal nostrum with special health-giving properties. Such a claim would last only temporarily and appeal only to a fringe of the consuming public. Yogurt is a food and should be aimed at everybody.

## MATERIALS AND METHODS

### *Samples*

Forty-four samples of all available kinds of yogurt were purchased in State College (Central Pennsylvania) supermarkets during August 1972. The samples were from 7 manufacturers and included 3 plain and 41 fruit yogurts (both Sundae and Swiss-style).

### *Sample preparation*

Each container was weighed and the entire contents were transferred to a Waring blender for a 3-min high-speed mixing. Mixed samples were then poured into plastic bags (Whirl-Pak, NASCO, Fort Atkinson, Wisconsin).

### *Product weight determination*

After rinsing and drying each complete yogurt container (all were 8-oz paper or plastic) they were reweighed and the net weight obtained by subtraction.

### *Protein content*

The percent protein was determined for each sample in duplicate by the official Kjeldahl method for total nitrogen in milk (3).

### *Total solids content*

Method I of the official method for total solids in milk (3), with minor modifications, was used to determine T.S. percentage. Analyses were done in duplicate.

### *Fat content*

The Mojonnier modification of the Roesse-Gottlieb method for fat in milk was used (2).

### *Caloric value*

The calories per 100 gram of yogurt were calculated according to the following equation:

$$\text{cal} = (\% \text{fat} \times 9) + [\% \text{T.S.} - (\% \text{fat} + 0.7\%)] \times 4$$

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TABLE 1. ANALYSIS OF YOGURT SOLD IN CENTRAL PENNSYLVANIA

Manufacturer	Type	Protein	Fat	T.S.	pH	Net wt.	Cal/100g
		(%)	(%)	(%)		(oz)	
A	O <sup>1</sup>	4.46	1.43	28.23	4.10	9.33	117.80
	P <sup>2</sup>	4.98	1.56	19.20	4.10	8.58	80.97
	PE <sup>3</sup>	4.40	1.36	27.96	4.20	8.83	115.31
	O	4.42	1.36	27.61	4.20	8.43	114.18
B	S <sup>4</sup>	4.17	1.70	25.97	3.90	8.24	109.00
	C <sup>5</sup>	3.98	1.86	27.12	3.90	8.30	115.50
	B <sup>6</sup>	4.15	2.04	25.20	3.90	8.12	108.19
	C	4.01	1.85	26.59	3.90	8.28	112.02
	B	4.16	1.76	25.56	3.95	8.15	108.44
	S	4.51	1.40	18.32	3.80	7.88	78.03
	O	4.03	1.60	25.18	3.80	8.35	105.61
C	C	4.03	0.82	22.02	4.10	8.24	88.73
	R <sup>7</sup>	4.32	0.84	24.11	3.90	8.05	97.86
	PE	4.36	0.94	20.73	3.85	8.22	84.64
	O	4.20	1.16	23.26	4.00	7.96	96.07
	B	4.32	0.85	22.58	4.15	9.70	91.99
	S	3.95	0.85	24.41	3.85	8.02	99.80
	O	4.36	0.99	20.45	4.00	7.97	84.16
	O	3.94	0.85	22.35	4.00	8.37	91.16
	P	5.06	1.00	15.10	4.30	8.46	62.34
D	S	4.19	0.92	24.99	4.35	8.74	102.00
	O	4.42	1.05	24.80	4.20	8.57	101.62
	O	4.12	.96	25.69	4.10	8.84	102.49
	O	4.37	1.09	24.07	4.35	8.79	100.38
	R	4.25	1.06	24.85	4.05	8.71	99.85
E	P	5.38	1.79	17.05	3.80	8.49	74.89
F	O	3.55	1.26	26.36	4.10	8.37	104.31
	O	3.76	1.26	24.61	4.10	8.79	107.40
	O	3.77	1.39	23.31	4.10	8.44	107.05
	R	3.83	1.33	26.27	4.05	8.84	99.39
	S	3.44	1.19	25.84	3.90	8.83	106.43
	O	3.84	1.17	25.74	3.90	8.73	107.53
	O	4.12	1.37	23.77	4.05	8.86	99.39
	O	4.44	1.59	20.10	4.10	8.71	91.16
G	C	4.58	0.91	31.05	4.00	8.84	125.66
	S	4.21	0.85	29.71	3.90	8.81	118.93
	P	4.23	0.88	29.50	4.00	8.64	118.67
	B	3.09	0.87	30.73	4.00	8.85	124.34
	O	4.28	1.00	27.46	3.90	8.75	111.88
	O	5.31	1.05	24.02	4.05	8.61	101.51
	P	5.26	1.01	25.41	3.80	8.52	103.70
	R	4.98	0.97	30.14	3.85	8.83	123.47
	C	4.74	0.92	31.25	3.95	8.86	126.98
	B	4.75	1.17	29.17	3.90	8.83	119.68

<sup>1</sup>O = A flavor other than those listed below.

<sup>2</sup>P = Plain.

<sup>3</sup>PE = Peach.

<sup>4</sup>S = Strawberry.

<sup>5</sup>C = Cherry.

<sup>6</sup>B = Blueberry.

<sup>7</sup>R = Raspberry.

*pH Value*

A Corning pH meter Model 7 was used to determine the pH of each mixed sample.

*Statistical evaluation*

Standard deviation and variance were determined by computer.

**RESULTS**

Table 1 shows the results of this survey. The manufacturers' names are coded A-G. The types of yogurt were P = Plain, S = Strawberry, B = Blueberry, C = Cherry, PE = Peach, R = Raspberry. O = some other flavor. No indication as to Sundae-style or Swiss-style is made, since it has no bearing on nutritional or compositional data.

The average, range, variance, and standard deviation were computed for protein, fat, and total solids contents and for calories/100g, pH, and net weight. These results are in Table 2.

**DISCUSSION**

Public knowledge of yogurt is largely based on relatively old and dubious government data (7).

Table 3 is part of the entry for yogurt in USDA Handbook No. 8. It also includes, for comparison, the composition of milk, ice cream, sherbet, and partially skimmed milk with 2% nonfat milk solids added.

Obviously, there are noteworthy differences between official (average) and actual yogurt compositional values and also between the analytical data of practically any two different types of yogurt. Table 3 points out the true relationship of yogurt to other milk products. Despite its need for revision, *Handbook No. 8* is the best source available for our comparisons.

The average caloric value of yogurt on the market (100 cal/100g) lies somewhere between that of ice cream (200 cal/100g) and whole or fortified milk (60 cal/100g). True skimmilk has 36 cal/100g. *Handbook No. 8* does not give data for fruit yogurt, which is now practically dominating the U. S. yogurt market, and it ignores the fact that about 2% milk solids are added to plain yogurt. Fortunately, this very widely quoted source is reported to be under

TABLE 2. SUMMARY OF ANALYSIS OF 44 YOGURT SAMPLES FROM THE CENTRAL PENNSYLVANIA AREA

	Average	Range	Variance	Standard deviation
Protein	4.29%	3.09- 5.38%	0.22	0.4717
Fat	1.18%	.82- 2.04%	0.1439	0.3794
Total Solids	24.97%	15.10- 30.73%	13.3105	3.6484
Calories/100g	103.21	62.34-126.98	198.0182	14.0719
pH	4.01	3.80- 4.35	0.0204	0.1427
Net Weight	8.56 oz	7.88- 9.33 oz	0.1299	0.3604

TABLE 3. COMPOSITION OF YOGURT AND OTHER DAIRY PRODUCTS ACCORDING TO U.S.D.A. Handbook No. 8

Product	G/100g					Cal./100g
	Water (%)	Protein	Fat	Carbohydrate	Ash	
Yogurt made from partially skimmed milk	89.0	3.4	1.7	5.2	0.7	50
Yogurt made from whole milk	88.0	3.0	3.4	4.9	0.7	62
Whole milk	87.4	3.5	3.5	4.9	0.7	65
Partially skimmed milk with 2% nonfat milk solids added	87.0	4.2	2.0	6.0	0.8	59
Ice cream	63.2	4.5	10.6	20.8	0.9	193
Sherbet	67.0	0.9	1.2	30.8	0.1	134
Yogurt data from Table 2	75.0	4.29	1.18	18.3	0.7	103

revision. The caloric content of fruit yogurt is so high because of the large amount of sugar added with the fruit. For this reason, fruit yogurt, as presently manufactured, should never be considered a low-calorie item, no matter how much fat is removed from the yogurt. Consequently, the labeling of such yogurt as 99 or 98% fat-free is misleading. It can be assumed that many consumers, with their ignorance of food chemistry and nutritional sciences, will confuse a "low-fat" or "99% fat-free" label with the low-calorie concept they might be pursuing. It is such misinformation, confusion and quiet exploitation of ignorance that has prompted the Food and Drug Administration to propose detailed nutritional labeling for food products. The principle of *caveat emptor* seems to operate in the yogurt market as well as in other areas. Should the dairy industry act ahead of the future mandatory nutritional labeling program and point out yogurt's true identity and relationship to other milk products? Would the dairy industry earn the good will of consumers by openly advertising all compositional and nutritional facts of yogurt? Would yogurt sales be harmed if it were admitted that yogurt has frequently been misrepresented as a low-calorie or diet item? A collaborative analytical study throughout the country might well be a desirable prelude to yogurt standardization.

Much of the variation in yogurt is due to variable fruit addition. As pointed out before, the entire mixed yogurt package content was analyzed. Only a plain, unflavored yogurt can reflect the composition of the milk from which it was made. Even then

there was a loss of lactose because of its fermentation into predominantly lactic acid.

In fruit yogurt the total solids or solids-not-fat content is strongly dependent on the fruit addition. Usually a puree or preserve is added, sweetened primarily with sucrose. The sweetener and fruit mask the typical yogurt flavor which, when too strongly developed or when containing off-flavors, is not well liked by many. Unfortunately, the sucrose contributes the largest proportion of calories to fruit yogurt.

The usual pH range of plain yogurt after incubation is 4.0-4.4. Measurement of pH in yogurt may be a valuable practice in monitoring its manufacture; it does not seem to be an indicator of quality at point of sale or to correlate with the type of fruit added.

Yogurt package labeling is as confusing to the buyer as yogurt composition is to the dietician. Of the 44 samples investigated, the 5 different fat content label comments were: (a) lowfat (unhyphenated); (b) 98-99% fat free; (c) 98% fat free/approx. 2% fat; (d) 99% fat free/only 1% fat, and (e) no statement at all.

Ingredient labeling was found to be more confusing and would take up too much space in this discussion. The most important fact probably was that one manufacturer included water in the ingredient list, another fresh, partially skimmed, homogenized, pasteurized milk, a third used cultured lowfat milk, and another made no mention of dairy ingredients at all, merely listing, for example, "peaches, sugar, vegetable stabilizer" to satisfy the ingredient label-

ing requirement.

Despite the great and increasing interest in yogurt there are no clear data available on why people buy and eat yogurt. It is generally admitted that yogurt is surrounded by a lore of almost mythical proportions. Yogurt manufacturers have obviously benefited by it. So have yogurt eaters because the nutritive value of yogurt is undisputed.

#### ACKNOWLEDGMENT

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## "MILK FACTS" INCLUDES REPORT ON NEW DAIRY PRODUCT ITEMS

Sales data on yogurt, flavored milks and drinks, sour cream and other specialty items are new additions to the just published "Milk Facts," the annual report by the Milk Industry Foundation.

Also reported is that milk production in the United States in 1972 rose to a record-setting 120.3 billion pounds, the third consecutive year production has increased. Total fluid milk product sales in 1972 in the nation gained 2 1/2 percent, the largest increase in a decade, and per capita milk production increased 1 percent, the first gain since 1955.

Included in the booklet is information on milk production, processing, distribution, consumption, nutrition, and economics. The publisher, the Milk Industry Foundation, is the national association of dairy processor and distributor companies.

Dairy farmer income from milk sold to processors increased nearly \$4 million in 1972 over the previous year, totaling \$6.9 billion. Continuing a trend of recent years, the sale of low-fat milk items in 1972 was up substantially over the prior year—about 11 percent. Lowfat and skim products accounted for about 25% of total sales of fluid milk and cream, compared with about 7 percent in 1960. Cheese sales were up a significant 12 percent, while ice cream increased about 2 percent.

#### NEW FEATURES

Among the other new features in "Milk Facts" this year is a table showing the relative cost of protein as provided by various foods. Fluid milk, cheese and ice cream were among the lowest cost sources of protein, and at the same time, provided a very high quality protein. A third new item is a report showing dairy product production and per capita consumption in foreign countries.

#### A GOOD BUY

During a period when food costs have risen sharply, this item from "Milk Facts" is particularly important: while prices consumers paid for milk were somewhat higher in 1972 than in 1971, milk was a better bargain ever in terms of its "real" cost. As a comparison, twenty years ago, an hour's wages would purchase about 7 quarts of milk; in 1972 an hour's earnings would buy 13 quarts, a decline in the "real" cost of milk of about 43 percent.

#### ADDITIONAL INFORMATION PROVIDED

"Milk Facts" also reported that:

- Per capita sales of fluid milk products in the United States in 1972 was 137.5 quarts.

- Cream and lowfat creamed cottage cheese continued to grow in popularity with per capita consumption up .2 pounds over the previous year.

- Wisconsin, California, and New York State, in that order, were the leading milk production states in the country.

- Per capita sales of yogurt went up a whopping 442% from 1961 through 1972, while eggnog, sour cream and dips, and flavored milk and drinks also increased substantially.

The 32 page booklet of the Foundation also contains interesting data on how milk is processed from dairy farm to consumer, and how the milk industry maintains product wholesomeness, and a segment is devoted to the various nutritional elements in fluid milk. Material is presented by individual states, regions and nationally.

Copies of "Milk Facts" are available from the Foundation for members at 6c per copy up to 1,000 or 5c per copy for orders of 1,000 or more. Non-members' price is 7c per copy. Orders should go to the Milk Industry Foundation, 910 17th St. NW, Washington, D. C. 20006.